

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (original): A method comprising:

detecting, using magnetic resonance imaging, regional neural activity in a subject undergoing magnetic resonance imaging based on transient magnetic fields induced by the regional neural activity; and

spatially and temporally localizing the regional neural activity using at least a portion of the detected transient magnetic fields.

Claim 2 (original): The method of claim 1, wherein the magnetic resonance imaging comprises applying an asymmetric pulse sequence to the subject.

Claim 3 (original): The method of claim 2, wherein the asymmetric pulse sequence comprises a gradient-echo echo-planar image pulse sequence.

Claim 4 (original): The method of claim 3, wherein the asymmetric pulse sequence comprises a repetition time of between approximately 40 and 10,000 milliseconds, an echo time of between approximately 10 and 200 milliseconds, and a flip angle of between approximately 10 and 180 degrees.

Claim 5 (original): The method of claim 1, wherein the detecting comprises measuring magnetic resonance imaging signal magnitude changes.

Claim 6 (original): The method of claim 1, further comprising stimulating the subject with a hemodynamically neutral stimulation.

Claim 7 (original): The method of claim 6, wherein the hemodynamically neutral stimulation comprises providing rapid stimuli to the subject.

Claim 8 (cancel)

Claim 9 (original): The method of claim 1, further comprising performing a second nervous system measurement technique to conjoin with the magnetic resonance imaging.

Claim 10 (original): The method of claim 9, wherein the second nervous system measurement technique measures at least one of cerebral hemodynamic, metabolic, and neural activity.

Claim 11 (original): The method of claim 1, further comprising detecting intrinsic rhythms of a nervous system of the subject using the regional neural activity.

Claim 12 (original): The method of claim 1, further comprising diagnosing a disorder of a nervous system of the subject using the regional neural activity.

Claim 13 (original): The method of claim 1, further comprising analyzing a drug effect on a nervous system of the subject using the regional neural activity.

Claim 14 (original): A method comprising:  
performing magnetic resonance imaging on a subject; and  
directly mapping electromagnetic activity of the subject via the magnetic resonance imaging.

Claim 15 (original): The method of claim 14, wherein the magnetic resonance imaging comprises applying an asymmetric pulse sequence to the subject.

Claim 16 (original): The method of claim 15, wherein the asymmetric pulse sequence comprises a gradient-echo echo-planar image pulse sequence.

Claim 17 (original): The method of claim 14, further comprising measuring magnetic resonance imaging signal magnitude changes.

Claim 18 (original): The method of claim 14, further comprising stimulating the subject with a hemodynamically neutral stimulation.

Claim 19 (original): The method of claim 14, further comprising performing a second nervous system measurement technique to conjoin with the magnetic resonance imaging.

Claim 20 (original): The method of claim 14, further comprising detecting intrinsic rhythms of a nervous system of the subject via the electromagnetic activity.

Claim 21 (original): The method of claim 14, further comprising diagnosing a disorder of a nervous system of the subject based on the electromagnetic activity.

Claim 22 (cancel)

Claim 23 (original): An article comprising a computer readable medium containing instructions that if executed, enable a system to:

detect, using magnetic resonance imaging, regional neural activity in a subject undergoing magnetic resonance imaging based on transient magnetic fields induced by the regional neural activity; and

spatially and temporally localize the regional neural activity using at least a portion of the detected transient magnetic fields.

Claim 24 (cancel)

Claim 25 (original): The article of claim 23, further comprising instructions that if executed enable the system to measure magnetic resonance imaging signal magnitude changes.

Claim 26 (original): A system comprising:

a magnetic resonance imaging scanner having a plurality of magnets to generate a magnetic field around a subject; and

a controller coupled to the magnetic resonance imaging scanner to detect a magnitude of magnetic resonance signals representing a neuronal magnetic field.

Claim 27 (original): The system of claim 26, wherein the plurality of magnets comprises a main magnet and a gradient magnet.

Claim 28 (original): The system of claim 26, wherein the controller is further adapted to directly map electromagnetic activity of the subject via the magnitude of the magnetic resonance signals.

Claim 29 (original): The system of claim 28, wherein the map comprises a spatial and temporal localization of neuronal activity of the subject.

Claim 30 (original): The system of claim 26, further comprising a second controller coupled to the magnetic resonance imaging scanner to provide an asymmetric pulse sequence to the magnetic resonance imaging scanner.

Claim 31 (original): The system of claim 26, further comprising a stimulus generator to provide a stimulus to the subject.

Claim 32 (original): The system of claim 31, further comprising a measurement device to measure a response of the subject to the stimulus.

Claim 33 (cancel)

Claim 34 (original): An article comprising a computer readable medium containing instructions that if executed, enable a system to:

receive magnitude resonance signals from a subject of a magnetic resonance imaging system; and

process the magnitude resonance signals to directly map neuronal activity of the subject.

Claim 35 (original): The article of claim 34, further comprising instructions that if executed enable the system to localize the neuronal activity spatially and temporally.

Claim 36 (original): The article of claim 34, further comprising instructions that if executed enable the system to generate an image based on the neuronal activity.

Claim 37 (new): The method of claim 1, further comprising detecting the regional neural activity in a predetermined window prior to or after hemodynamic activity in the subject as a result of the regional neuronal activity.

Claim 38 (new): The method of claim 14, further comprising directly mapping the electromagnetic activity based on magnetic resonance imaging data obtained in a predetermined window prior to or after hemodynamic activity in the subject as a result of regional neuronal activity.

Claim 39 (new): The article of claim 23, further comprising instructions that when executed enable the system to detect the regional neural activity in a predetermined window prior to hemodynamic activity in the subject as a result of the regional neural activity.

Claim 40 (new): The system of claim 26, wherein the controller is to detect regional neuronal activity in a predetermined window prior to hemodynamic activity in the subject as a result of the regional neuronal activity.